DISSERTATION ON

INCIDENCE OF REEXPLORATION IN CARDIAC SURGERY UNDER CARDIO PULMONARY BYPASS

Submitted in partial fulfilment of

Requirements for

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CERTIFICATE

This is to certify that this dissertation entitled **"INCIDENCE OF REEXPLORATION IN CARDIAC SURGERY UNDER CARDIO PULMONARY BYPASS"** *submitted by* **Dr. H.R.SHAKIR** *appearing for MCH., Degree examination in August 2007, is a bonafide record of work done by him under my direct guidance and supervision, in partial fulfillment of regulations of the Tamil Nadu Dr. M.G.R. Medical University, Chennai. I forward this to the Tamil Nadu Dr. M.G.R. Medical University, Chennai, Tamil Nadu, and India.*

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DECLARATION

I solemnly declare that the dissertation titled "**INCIDENCE OF REEXPLORATION IN CARDIAC SURGERY UNDER CARDIO PULMONARY BYPASS**" *is done by me at the Department of Cardio Thoracic Surgery, Madras Medical College & Govt. General Hospital, Chennai during 2004-2007.*

The dissertation is submitted to The Tamilnadu Dr. M.G.R. Medical University towards the partial fulfillment of requirements for the award of MCH in Cardiac Thoracic Surgery.

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CONTENTS

INTRODUCTION

Cardiac Surgery being the most modern and conceptualized surgery which involves cardiopulmonary bypass Clotting Mechanism, Temperature Control, Haemodilution and Cardiolegic arrest, etc. The failure off any off these mechanisms ends up in a cascading effect of morbidity and mortality of the patients.

The complications associated in the post operative period like cardiac failure renal dysfunction, pulmonary dysfunction and cerebrovascular accident play a major role in determining the out come.

Post operative bleeding and Reexploration are inherent complications associated with cardiac surgery.

The Adverse out come as a result of postoperative bleeding and Reexploration has been the subject of the present study.

AIMS OF THE STUDY

The present study was primarily undertaken to study the incidence off Reexploration in Cardiac Surgery among patients subjected to cardio pulmonary bypass at department off cardio thoracic surgery, Madras Medical College, Chennai. Thereby identifying the factors contributing to Reexploration and adapting suitable measures to reduce the incidence of Reexploration.

Reexploration remains a inherent complication associated with open heart surgery which in turn contributes towards increased morbidity, prolonged hospitalization infection, multiple organ dysfunction and even death.

OBJECTIVES

To assess mortality and risk factors associated with Reexploration for hemorrhage in patients under going open heart surgery. To initiate appropriate steps in reducing the incidence of Reexploration. During the course of this study an effort has been made to highlight the cost off hospitalization resulting from Reexploration. The incidence of complications resulting from the same and the their management. The pre, intra and post operative measures that play a vital role have been stressed upon.

REVIEW OF LITERATURE

CARDIO PULMONARY BYPASS

History

The first major step in the invention of open heart surgery, was taken by Gibbon in late 1930. In 1951 dennis and associates take the credit for performing the first cardiac operation using the equipment hypothermia remains a integral part of CPB. The combination of Hypo Thermia was first reported by Sealy and colleagues in 1958. Core cooling using cardio pulmonary bypass to achieve circulatory arrest was reported by hamilton and collegues.

CARDIOPULMONARY BYPASS

A technique by which the pumping action of the heart and gas exchange function of the lung are temporarily replaced by a mechanical device pump oxygenator attached to the patients vascular system.

Cardio pulmonary bypass is a in dispensible technique in under taking cardiac surgery. Cardiac surgery can be performed under total and partial bypass.

Total bypass is one were all the systemiec venous return to the pump oxygenator instead of the heart. In partial bypass a portion of the systemic venous blood returns to the heart and is ejected out into the aorta.

ELEMENTS OF CARDIO PULMONARY BYPASS

The central component of the system is the oxygenator which allows the oxygenation of blood and elimination of carbon dioxide. Initially bubble oxygenators were used which allow gas exchange at blood gas interface. Presently membrane oxygenators in which gas exchange occurs through a tiny pores in a membranes. Silicone oxygenators are used particularly because of their stability for long periods for extra corporeal membrane oxygenation.

The venous reservoir stores excess volume it is positioned to allow siphonage of blood by gravity and by slight negative pressure in the tubes by virue of controlled vaccum pressure. The arterial

pump generates non pulsatile blood flow. Roller pumps are used because they cause less damage to blood cells. Blood in the operating field is returned to the reservoir by way off cardiotomy suction lines. However the blood contains air that is filtered out before the blood is returned to the system. Following cannulation of aorta and both superior and inferior vena cavae after systemic heparinsation the bypass is gradually instituted. A flow rate is maintained after calculating the patients body surface area.

HAEMATOCRIT of the patients and pump oxygenator blood volume is determined by the composition and amount of the blood and fluid infused before and after initiation of the bypass. Hypothermia increases viscosity thus at a low temperature the haemotocrit is kept low.

TEMPERATURE OF PERFUSATE

Virtually all procedures are done under some degree of hypothermia. Hypotehrmia reduces Oxygen consumption. Vant hoffs reaction is directly related to temperature. Hypothermia in CPB allows low perfusion flow rates thereby reducing traume to the

cellular elements. Systemiec hypothermia minimizes warming off the heart that may impair myocardial protection.

GLUCOSE

Kept at 350 mg/dl to provide source of energy and promote osmotic diuresis.

SYSTEMIC HEPARINISATION

Done by administering 300 units / kg heparin. Heparin an anticoaugulant.

ACT of 480 seconds is kept throughout the bypass and any fall is corrected by giving heparin at a dose off 100 units /KG. The ACT is monitored every 15 to 30 minutes during the bypass.

Protamine sulphate is given at the end of the procedure. Prior to decannulation. Protamine is a heparin antagonist that has a rapid onset of action. To calculate the dose of protamine to be given the ACT has to be measured before termination off bypass.

Dose for every MG of heparin 1.5 MG of protamine is given.

PERFUSION PRESSURE

Kept at 50 to 60mm of hg to maintain cerebral blood flow is maintained at 2.4 Litres / m^2 /min.

PATHOPHYSIOLOGIC EFFECTS OF CPB

Cardio pulmonary bypass is associated with increased level of IL6 IL8 and C3a. These are associated with haemadynamic instability and myocardial dysfunction.

The most potent being bleeding which contributes to Reexploration and is related to duration of CPB.

ADVERSE EFFECTS

A condition post perfusion syndrome in patients subjected to cardiopulmonary bypass is characterized by

Bleeding diathesis

Pulmonary dysfunction

Renal dysfunction

Fever

Leukocytosis

Increased susceptibility to infection.

Increased interstitial fluid retention

Bleeding tendency post operatively is related to the duration off bypass time.

The Safe CPB time is taken to be 180 minutes. The intensity off bleed depends on the individual patient.

Reference:

1. Body fluid shifts after cardiuopulmonary bypass. Cohn Lh, Angell WW, Shumway. et al. Journal of Thoracic and Cardiovascular Surgery 1971.

2. Pyrexia following open heart surgery. Anesthesia 1974. De Villota Ed, Barat G, Astorqui F, Dimaso D, Aveloo F. et al.

3. An improved method of dealing with complications after cardiopulmonary bypass. Journal of Thoracic and Cardiovasc

Surgery 1986. Josa M, Khuri SF, Barunwalk NS, Vancisin MF, Spencer MP, Evans DA, Barsamian EM. et al.

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POSTOPERATIVE BLEEDING

And cardiac tamponade are the fore most factors that contribute towards Reexploration in cardiac surgery under cardio pulmonary bypass.

Cardiac surgery increases post operative bleeding tendency. The primary causes being fibrinolysis caused by blood contact with biomaterial components of the heart lung machine and the blood suctioned out from the operative site. The degree of fibrinolysis corelates to the duration of cardio pulmonary bypass time. Platlet dysfunction and systemic heparinisation contribute as well. Haemodilution decreases the number of platlets coupled with hypothermia induced platelet dysfunction and coagulation enzyme

cause bleeding diasthesis. Heparin rebound the recurrence of heparin activity after complete neutralisation with protamine is caused by the elution of heparin from plasma proteins.

The role of pre-operative factors in causing post operative bleeding has been a subject to study ever since. Patients on pre operative anti coagulant therapy have a increased risk of having post operative bleed. Thus patients on anti coagulants are best subjected to surgery atleast a week after discontinuation of anticoagulant therapy. The role of intra operative factors like attention on achieving meticulous haemostasis, rexamination of surgical sites and the importance of sound surgical techniques aids in reducing the surgical cause of bleeding.

Reference:

1. Reexploration for bleeding is a risk factor for adverse outcomes after cardiac operations. Moulton MJ, Creswell LL, Mackey ME, Cox JL, Rosenbloom M. et al.

   Department of Surgery, Division of Cardiothoracic Surgery, Washington University, St. Louis, MO 63110, USA.

2. Reexploration for hemorrhage following coronary artery bypass grafting: incidence and risk factors. Northern New England Cardiovascular Disease Study Group.

   Dacey LJ, Munoz JJ, Baribeau YR, Johnson ER, Lahey SJ, Leavitt BJ, Quinn RD, Nugent WC, Birkmeyer JD, O' Connor GT. et al.

   Department of Surgery, Dertmouth- Hitchcock Medical Center, Lebanon, NH, USA.

3. An audit of Reexploration for bleeding following coronary artery bypass surgery. Karthik S. Mc Carron EE. Grayson Ad. Pullan DM, Desmond MJ. et al. The Cardiothoracic Centre – Liverpool, Merseyside, United Kingdom.

4. Risk factors for hemorrhage-related Reexploration and blood transfusion after conventional versus coronary revascularization without cardiopulmonary bypass.

   Frankel Timothy L. Stamou Storiris C. Lowery Robert C. Kapetanakis Emmanouil I, Hill Peter C. Haile Elizabeth, Corso Paul J. et al.

HEART LUNG MACHINE

PERIOSTIAL BLEEDING FROM STERNUM BEING CONTROLLED BY CAUTERIZATION

BLEEDING FROM CP CANNULATION SITE BEING ARRESTED WITH 4^{O} PROLINE

POSTOPERATIVE BLEEDING THAT REQUIRES REEXPLORATION

(Kirkulin and Barrett Boyce Text Book of Cardiac Surgery 2003)

Preoperative Weight (kg)	Chest Drainage Indicating Reoperation				
	Hourly Amount (ml* h^{-1})			Hour No.[b]	
	No. of Successive Hours[a]				
	1	2	3	4	5
5.0	70	60	50	120	130
6.0	70	60	50	130	155
7.0	70	60	50	150	180
8.0	90	70	50	175	200
9.0	90	80	60	195	230
10.0	100	90	65	220	260
12.0	130	100	80	260	300
14.0	150	120	90	300	360
16.0	170	140	100	350	400
18.0	195	150	120	390	460
20.0	200	175	130	450	520
25.0	270	220	160	540	650
30.0	325	260	195	650	770
35.0	380	300	230	760	900
40.0	430	350	260	800	1,035
45.0	500	400	300	975	1,150
50.0	500	400	300	1,000	1,200

a. Re-operation is advisable if the patient has bled the amount indicated in any 1 hour (column 1), the lesser amount in column 2 during each of any 2 successive hours or the still smaller amount (column 3) in each of any 3 successive hours.

b. Reoperation is advisable, if by the end of the fourth or fifth postoperative hour, the patient has bled in total the amount indicated.

CARDIAC TAMPONADE

Produced by sudden oppression of the heart by rapidly accumalating blood or clots in the pericardial space is an emergency that requires Reexploration. Acute cardiac tamponade which occurs in early post operative period causes reduced preload and low cardiac output. Undrained intra pericardial bleeding causes tamponade. The condition is associated with increased right and left atrial pressures which are not always equal. Arterial pressure falls and pulsus paradoxus is replaced with a narrow pulse pressure. Characteristically arterial pressure shows minimal response to increased inotropic support. In children it may present as a sudden decrease in urine output. A sudden decrease in post operative drain

which was brisk previously must raise suspicion of impending tamponade.

The condition is best diagnosed by Trans thoracic echo. The role of continuous monitoring off the invasive blood pressure, heart rate central venous pressure, chest drains and urine out put gives an indication of the patients haemodynamic stability.

Reference:

1. Post Operative cardiac tamponade: Diagnosis and management. Annuals of Thoracic Surgery 1978.

   Hardesty RL, Thompson M, Lerberg DB, Siewers RD, O' Toole JD, Salerni R, Bahnson HT: et al.

2. Cardiac Tamponade following open-heart surgery. Circulation 1970. Engelman RM, Spencer FC, Reed GE, Tice DA. et. al.

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4. Delayed Cardic tamponade associated with prophylactic anticoagulants. J Thorac Cardiovasc Surgery 1978. Hockberg MS, Merrill WH, Gruber H, McIntosh CL, Henry WL, Morrow AG. et al.

Left Ventricular Rupture as a Complication of Mitral Valve Replacement

Massive intrapericardial hemorrhage may occur shortly after discontinuing CPB or in the intensive care unit a few hours later. This complication is usually from left ventricular rupture in or near the atrioventricular groove posteriorly. Virutally all patients die when the rupture occurs postoperatively.

This complication is more likely to occur in women and in patients with small left ventricles.

The most common contributing factors to left ventricular rupture are undue traction on the annulus during excision of the mitral valve or insertion of the prosthesis, tearing of the annulus by already placed sutures when the heart is manually tilted up after the

mitral prosthetic device is in place, and penetration of stitches into the left atrioventricular groove posteriorly.

Complications can also result from perforation of the ventricular wall as a papillary muscle is excised and from perforation of the atrioventricular groove as a calcific deposit is being removed.

Because of this potential problem, the surgeon must be very gentle in all the maneuvers during mitral valve replacement.

Left ventricular rupture can occur in the mid-portion of the posterior wall, rather than in the region of the AV valve annulus. Penertration of pillar of a stented valve. It seems to occur primarily in women with small left ventricles.

The most obvious, and most easily avoided, is a pure atrioventricular (AV) groove rupture. A true Av grovve rupture may be caused from overzealous excision of the annulus, particularly when calcium is debrided from the posterior annulus, or from partial avulsion of the mitral annulus due to excessive traction while removing the valve or tying the sutures. This type of AV groove tear

can almost always be prevented by avoiding overly aggressive resection posteriorly and by minimizing upward traction during all parts of the operation. Valvular sutures must be inserted precisely into the annulus, rather than into the underlying ventricular muscle. The most common causes of primary AV groove overly aggressive resection posteriorly and by minimizing upward traction during all parts of the operation. Valvular sutures must be inserted precisely into the annulus rather than into the underlying ventricular muscle.

A Second type of left ventricular rupture can result from direct injury to the muscle, either by excising the papillary muscles too deeply and producing a "buttonhole" injuury or by choosing a prosthesis that is too large for the ventricular, which can produce injury from the valve struts. With present knowledge, direct injury to the left ventricular wall during mitral valve replacement is uncommon. Care is taken either to leave a rim of papillary muscle with the ventricle while excising the chordae or to preserve the chordae altogether.

The third type of ventricular rupture after mitral valve replacement, the midventricular freewall rupture, was designated

"Type III" by Miller in 1978. This type is the most puzzling, occurring as a transverse rupture midway between the annulus of the mural leaflet and the posterior papillary muscle.

Such fatal ruptures with clear illustrations from autopsy specimens. They hypothesized that these ruptures evolved from strong contractions of the left ventricle after removal of chordae attached to the mural leaflet – the "untethered loop" hypothesis.

Some chordae have been preserved to the annulus of the mural leaflet. It seems plausible that preservation of chordae is the major factor in preventing "Type III" midventricular freewall rupture.

Small or moderate-sized hematoma is present in the left AV groove in 10% to 30% of patients immediately after mitral valve replacement. Hematoma does not increase in size it should be left alone and uninspected and nothing further done. Rarely does this eventuate in left ventricular rupture.

Reference:

1. Left ventricular rupture following mitral valve replacement with preservation of posterior leaflet. Moizumi Y, Komatsu T, Nagaya K, Sawamura Y,Sakurai M, Tabyashi K. et al. Division of Cardiovascular Surgery, Sendai city medical center Japan.

2. Type I left ventricular rupture after mitral valve replacement.

   R Devineni and FN Mckenzie. et al. The Journal of Thoracic and Cardiovascular Surgery. The American Association for Thoracic Surgery and the Western Thoracic Surgical Association 1983.

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4. Rupture of the posterior wall of the left ventricle after mitral valve replacement. A Zacharias, LK Groves, C cheanvechai, FD Loop and DB effler. et al.

   The Journal of Thoracic and Cardiovascular Surgery, by The American Association for Thoracic Surgery and The Western Thoracic surgical Association

STERNAL INFECTION

These complications are usually in the form of mediastinitis and sternal dehiscence in a prospective study by Breyer, the incidence was 0.8%, but the incidence has been reported to be 1.5% by Culliford and colleagues and as high as 8% when bilateral internal mammary artery to coronary artery bypass grafting is performed. The mortality after this complication has been variously reported, from 6% to 70%. With early effective treatment, it is 5% to 10%.

RISK FACTORS

An Undrained Retrosternal hematoma is an incremental risk factor. This is one reason for leaving the pericardium open as a routine after cardiac operations, so that Retrosternal bleeding falls into the pericardial space.

Prolonged operative time is also a risk factor for the development of Mediastinal infections.

Inccurate and Insecure Sternal Closure increases the incidence of important Sternal Infections.

Reexploration for bleeding.

Obesity is clearly a risk factor for infection in the median sternotomy wound. The combination of diabetes, obesity, and harvesting of both internal mammary arteries has increased the prevalence of wound infections.

Chronic obstructive lung disease predisposes to sternal dehiscence and infection. Male gender is a risk factor.

Reference:

1. Sternal infections following open-heart surgery. A review of cases. Journal Thoracic Cardiovascular Surgery 1967. Culliford AT, Cunningham JN Jr, Zeff RH, et al.

2. Treatment of median sternotomy infection by mediastinal irrigation with an antibiotic solution. Annual Surgery 1969. Bryant LR, Spencer FC, Trinkle JK. et al.

3. Single Stage management of sternal wound infections. Journal Thoracic Cardiovascular Surgery 1990. Jeevanadam V, smith CR, Rose EA, Malm JR Hugo. et al.

4. Sternal Wound infection following open heart surgery, with special reference to the role of prophylactic antibiotics. among Reexploration Patients. Journal Thoracic Cardiovascular Surgery 1967. Eiror WB. et al.

MATERIALS AND METHODS

The present study was conducted at Department of Card thoracic Surgery, Madras Medical College, Govt. General Hospital, Chennai. From September 2004 to March 2007.

Among 1131 patients who underwent cardiac surgery under cardio pulmonary bypass. Patients who had problem of bleeding underwent Reexploration.

An overall incidence of Reexploration was 2.12% (24 / 1131) of patients.

Patients included in the study belonged to both sexes and age groups varying from 11 to 68 years.

The patients were subjected to routine investigations.

HEMATOLOGICAL

HB% Packed cell volume (PCV)

Total Count (TC) Differential count (DC)

Erythrocyte Sedementation Rate (ESR)

Platlet Count

Bleeding Time. (BT)

Clotting Time (CT)

Activated Clotting Time (ACT)

Blood Sugar

Blood Urea

Serum Creatinine

URINE ROUTINE EXAMINATION

LIVER FUNCTION TEST

Pulmonary Function Test

Xray Chest – PA

- AP
- Lateral

ELECTROCARDIOGRAM

ECHOCARDIOGRAM

M MODE

2D ECHO

DOPPLER ECHO.

DOPPLER FLOW

TRANS ESOPHAGEAL ECHO

CARDIAC CATHETERIZATION

CORONARY ANGIOGRAM

This was advised those who had history of coronary artery disease and in patients above 45 years of age who required valve replacement.

CT CHEST

In those Patients with Aortic stenosis to evaluate post stenotic dilatation of Aorta.

Sl. No	Age/ Sex	IP No.	Diagnosis	Surgery	CPB time in Mins.	Date of Surgery	Date & Time of exploration	Indications/ Bleeding	Site of Bleeding	Place of Reexploration	Out Come
1.	59/M	678664	TVD	CABG	121	27.9.04	8.30pm 27.9.04	1200 CC	RCA	CTPO	Expired
2.	57/M	680513	DVD	CABG	131	11.10.04	9.00 am 12.10.04	1200 CC	Fracture Sternum	CTOT	Sternal instability
3.	52/M	682962	DVD	CABG	181	1.11.04	9.00 am 2.11.04	1200 CC	Proximal	CTOT	Sternal Infection
4.	52/F	688738	RHMS	MVR	64	3.11.04	6.00 pm 3.11.04	1200 CC	LV free wall Rupture	CTPO	Expired
5.	37/F	689173	MS/MR	MVR	81	26.11.04	8.00 pm 26.11.04	1200 CC	Left Atrium	CTPO	Sternal Instability
6.	47/M	692916	TVD	CABG	171	29.11.04	9.00 am 30.11.04	1500 CC	LAD	CTOT	Expired
7.	60/M	702670	DVD	CABG	201	10.2.05	10.00 pm 10.2.05	1200 CC	No Bleeder Identified	CTPO	Expired
8.	54/M	705111	TVD	CABG	161	17.02.05	9.00 pm 17.2.05	1400 CC	Thymus	CTPO	Expired
9.	15/M	679491	TOF	ICR	164	07.04.05	10.00 pm 07.4.05	1100 CC	Trans Annualar Patch	CTPO	Expired
10.	58/F	705172	MRS	MVR	150	07.06.05	8.00 pm 07.6.05	1000 CC	No Bleeder Identified	CTPO	Expired

Sl. No	Age/ Sex	IP No.	Diagnosis	Surgery	CPB time in Mins.	Date of Surgery	Date & Time of exploration	Indications/ Bleeding	Site of Bleeding	Place of Reexploration	Out Come
11.	23/F	691814	MS/AS	DVR	160	21.06.05	8.00 pm 21.06.05	1200 CC	Aortic Cannulation	CTOT	Expired
12.	30/F	728991	ASD (OS)	PPC	26	09.07.05	9.00 am 10.07.05	1300 CC	Periostealedges	CTOT	Discharged
13.	50/M	712311	DVD	CABG	121	13.07.05	8.00 pm 13.7.05	1000 CC	CP Site	CTPO	Discharged
14.	11/F	536923	VSD	Direct Closure	60	07.08.05	10.00 pm 7.8.05	800 CC	Thymus	CTPO	Discharged
15.	18/M	738655	VSD	Patch Closure	86	25.8.05	9 am 26.8.05	1300 CC	RA	CTOT	Discharged
16.	45/F	732788	TVD	CABG	126	09.09.05	8 pm 09.09.05	1200 CC	Periostealedges	CTPO	Sternal Infection
17.	50/F	769989	TVD	CABG	156	27.01.06	8.pm 27.01.06	1200 CC	Distal	CTPO	Expired
18.	28/F	773014	MR	MVR	68	12.2.06	8 pm 12.2.06	1300 CC	RIMA	CTOT	Sternal Infection
19.	56/M	792200	TVD	CABG	180	06.07.06	7 pm 06.7.07	1500 CC	No Bleeder Identified	CTPO	Expired
20.	22/M	824704	AR	AVR	180	04.10.06	8 pm 04.10.06	1500 CC	Aortic Blow Out	CTPO	Expired

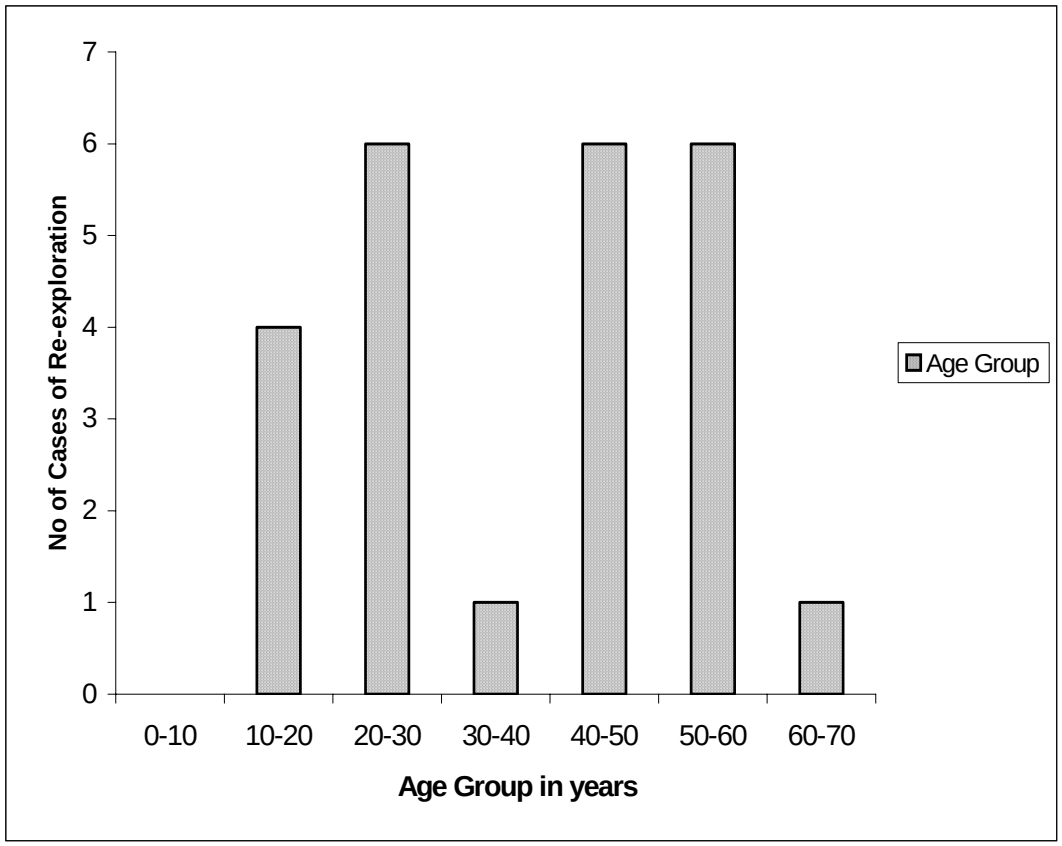
Sl. No	Age/ Sex	IP No.	Diagnosis	Surgery	CPB time in Mins.	Date of Surgery	Date & Time of exploration	Indications/ Bleeding	Site of Bleeding	Place of Reexploration	Out Come
21.	26/F	839184	ASD	PPC	28	23.10.06	8 pm 23.10.06	1000 CC	Innominate Vein	CTPO	Discharge
22.	11/M	536703	TOF	ICR	143	06.11.06	7.30 pm 06.11.06	600 CC	IVC	CTPO	Expired
23.	28/M	839467	ASD	PPC	28	09.11.06	8 pm 09.11.06	1200 CC	CP SITE	CTPO	Discharged
24.	49/M	002110	MRS/LA CLOT	MVR	156	27.03.07	8 pm 27.3.07	1200 CC	No Bleeder Site Identified	CTPO	Expired

INCIDENCE OF REEXPLORATION IN RELATION TO DISEASES

Diseases	Total No. of Cases	No. of Reexploration	Percentage
Congenital Heart Diseases	507	7	1.38%
Valvular Heart Diseases	420	7	1.66%
Coronary Artery Diseases	204	10	4.90%

RESULTS

INCIDENCE OF REEXPLORATION IN RELATION TO AGE



INCIDENCE OF REEXPLORATION IN RELATION TO AGE

Age	**Total No. of Reexploration**	**Number in Age Group**	**Percentage**
0 - 10	24	0	0
10 - 20	24	4	16.6
20 - 30	24	6	25
30 - 40	24	1	4.16
40 - 50	24	6	25
50 - 60	24	6	25
60 - 70	24	1	4.16

The study did not indicate increased incidence of Reexploration among any age group in particular.

Incidence was equally distributed among all age groups.

It was as high as 25% among the patient belonging to three different age groups (20 - 30), (40 - 50) and (50 - 60).

INCIDENCE OF REEXPLORATION IN

RELATION TO CPB TIME

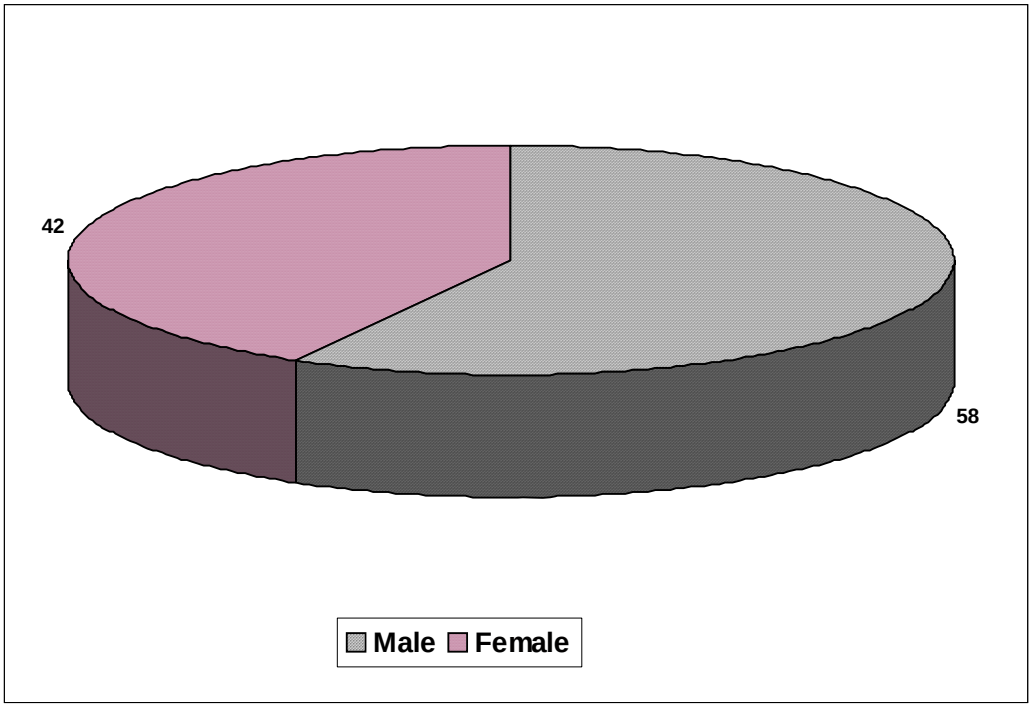
Total No. of Reexploration	Cardio pulmonary bypass time	No. of Reexploration in relation to CPB time	Percentage
24	0 - 30	3	12.5
24	30 - 60	1	4.16
24	60 - 90	5	20.83
24	90 - 120	1	4.16
24	120 - 150	6	25
24	150 - 180	6	25
24	180 - 210	2	12.5

Incidence of Reexploration was 58.3% (14/24) among patients who's CPB time exceeded 120 minutes.

INCIDENCE OF REEXPLORATION IN RELATION TO SEX

Among the Total of Number of patients who underwent Reexploration.

The incidence among	Males	-	58.33% (14/24)
	Females	-	41.66% (10/24)



INCIDENCE OF REEXPLORATION FOLLOWING OPEN HEART SURGERY FOR CONGENITAL HEART DISEASE

The overall incidence of Reexploration following open heart surgery was 1.38% (7/507)

Among the patients to under went Reexploration

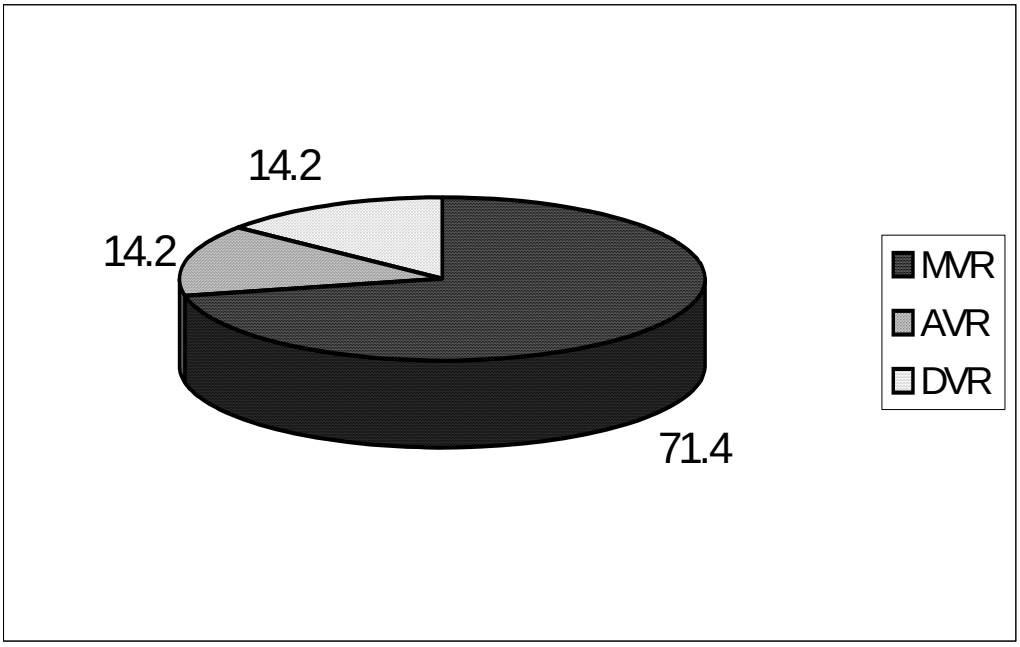
Patients who underwent open Heart Surgery accounted for 29.16% (7/24) of patients.

The incidence of Mortality in this group was 28.57% (2/7) of patients.

Among the 7 patients who had Reexploration 71.4% (5/7 of patients had a uneventful course after Reexploration.

THE INCIDENCE OF RE EXPLORATION IN PATIENTS

WHO HAD VALVE REPLACEMENT SURGERY



The incidence of re exploration in patients who had valve Replacement Surgery.

The patients who under went valve replacement Surgery accounted for 1.66% (7/420) in this group.

7 Patients who had valve replacement surgery accounted for among the total of 24 patients who had a under gone Reexploration.

Accounting for 29.1% of all cases of Reexploration. 71.4% (5/7) who had under gone Mitral Valve replacement patients accounted for 71.4% (5/7) of Reexploration.

Aortic valve replacement patients accounted for 14.2% (1/7).

Double Valve replacement patients accounted for 14.2% (1/7)

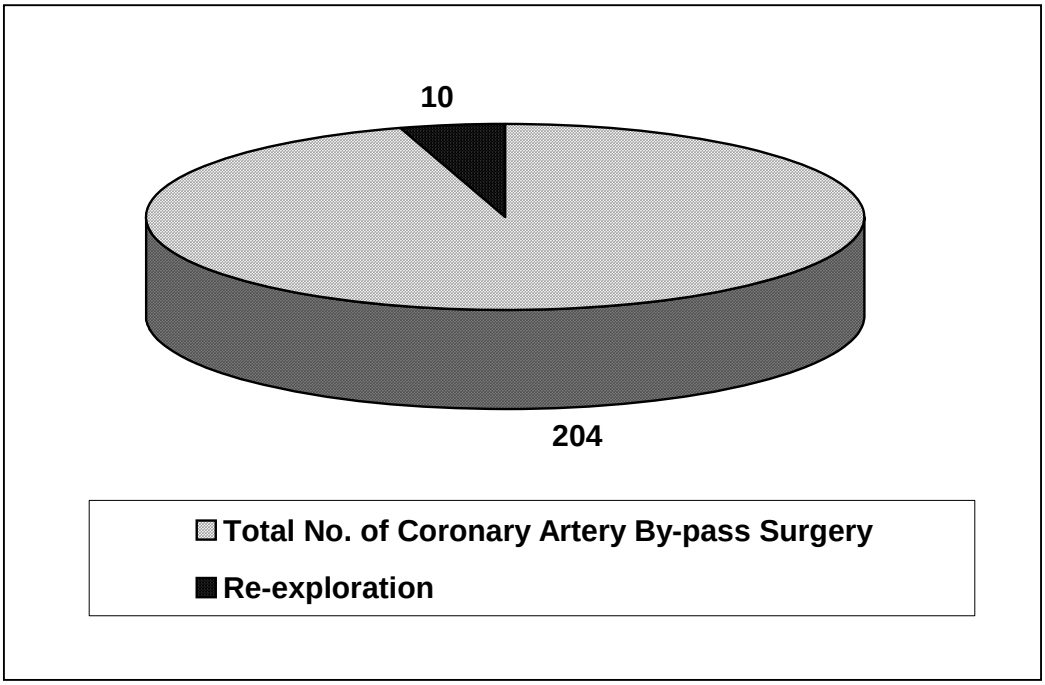
Overall Mortality following Reexploration in this group was 71.42% (5/7).

7 Patients who had a Reexploration after Valve replacement Surgery 28.5% (2/7) of the patients were undergoing Mitral Valve Replacement for Restenosis.

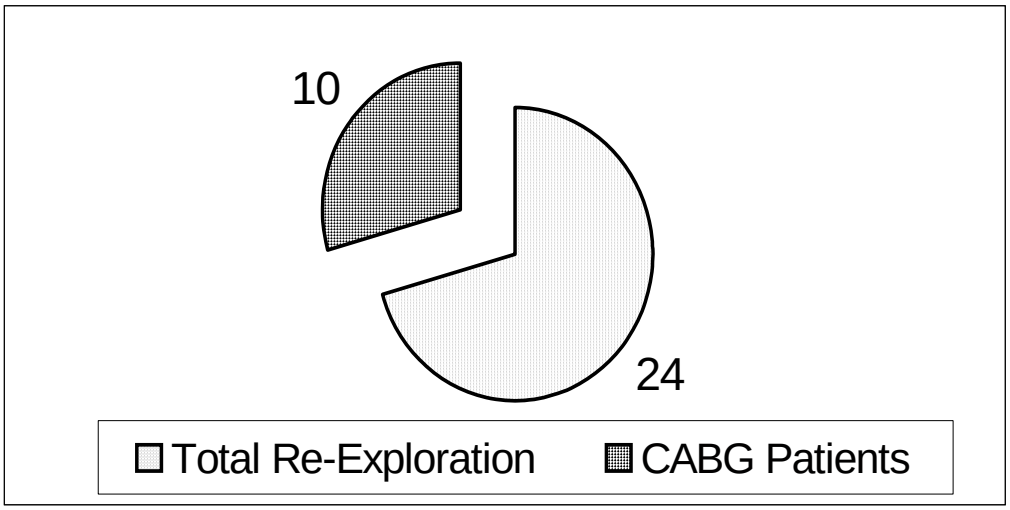
One patient who was Reexplored for Post Operative bleeding had a Left Ventricle Free Wall rupture following Mitral Valve Replacement.

INCIDENCE OF REEXPLORATION IN PATIENTS WHO UNDER WENT CORONARY ARTERY BY-PASS SURGERY

Number of Reexploration in relation to 204 patients who had undergone coronary Artery by-pass surgery.



Incidence of Reexploration was Highest Among those patients who undergone Coronary artery by-pass surgery in relation to the control.



Coronary Artery By-Pass Surgery Patients accounted for 41.6% (10/24) of those who underwent Reexploration.

The Incidence of mortality following Reexploration among patient's who had undergone CABG was 60% (6/10).

CABG patients who had Reexploration accounted for 46.15% (6/13) of the overall mortality among patients who had Reexploration.

While the overall mortality among the 24 patients who underwent Reexploration was 54.1%(13/24).

Incidence of Reexploration in patients who underwent Triple vessel coronary artery by-pass Surgery was 60% (6/10).

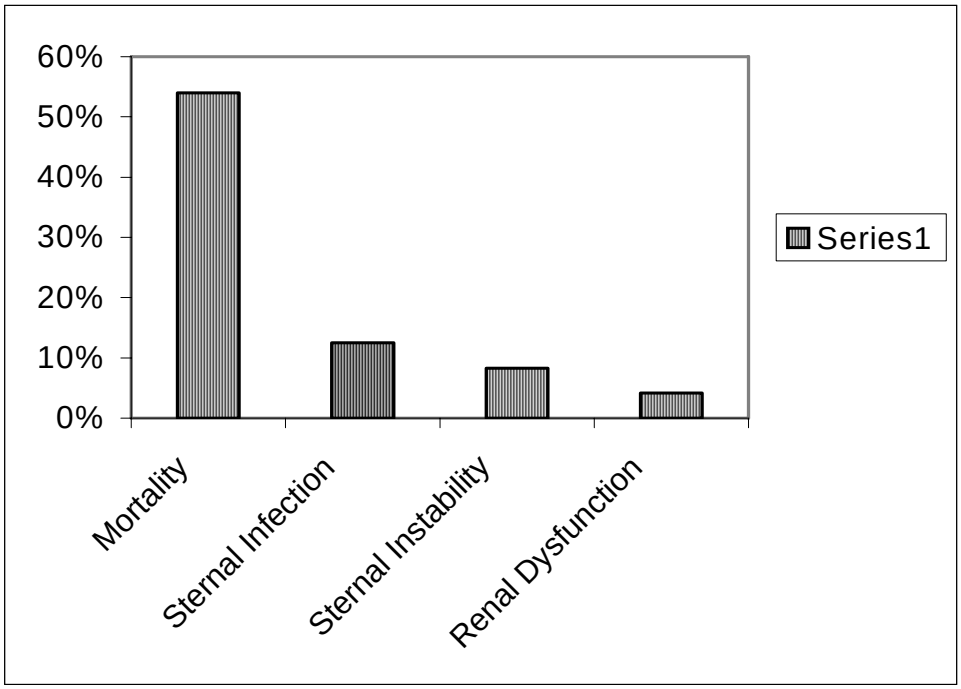
The incidence among patients who underwent Triple vessel coronary artery by pass surgery was Highest in this group.

Overall mortality among the patients who had Triple vessel coronary artery by pass surgery who had undergone Reexploration was 83.3% (5/6).

20% (2/10) Incident of sternal instability after Reexploration 10% (1/10) Incidence of sternal infection after Reexploration among this group.

One Patient underwent reexploration following CABG for DVD no bleeder site was identified.

INCIDENCE OF COMPLICATIONS FOLLOWING REEXPLORATIONS



Of the 24 patients who underwent a Reexploration 12.5% (3/24) had Sternal Infection.

Patients were treated with Inj. vancomycin (Q.I.D.) for 7 days. The organism implicated was M.R.S.A sensitive to vancomycin.

No incidence of Sternal Infection or Sternal Instability was recorded among patients with Congenital Heart Disease who had a Reexploration following Open Heart Surgery.

STERNAL INSTABILITY

Overall incidence was 8.3% (2/24).

One patient had undergone sternal banding for sternal instability.

The other patient was treated conservatively with sternal brace.

SITE OF BLEEDING IDENTIFIED IN REEXPLORATION

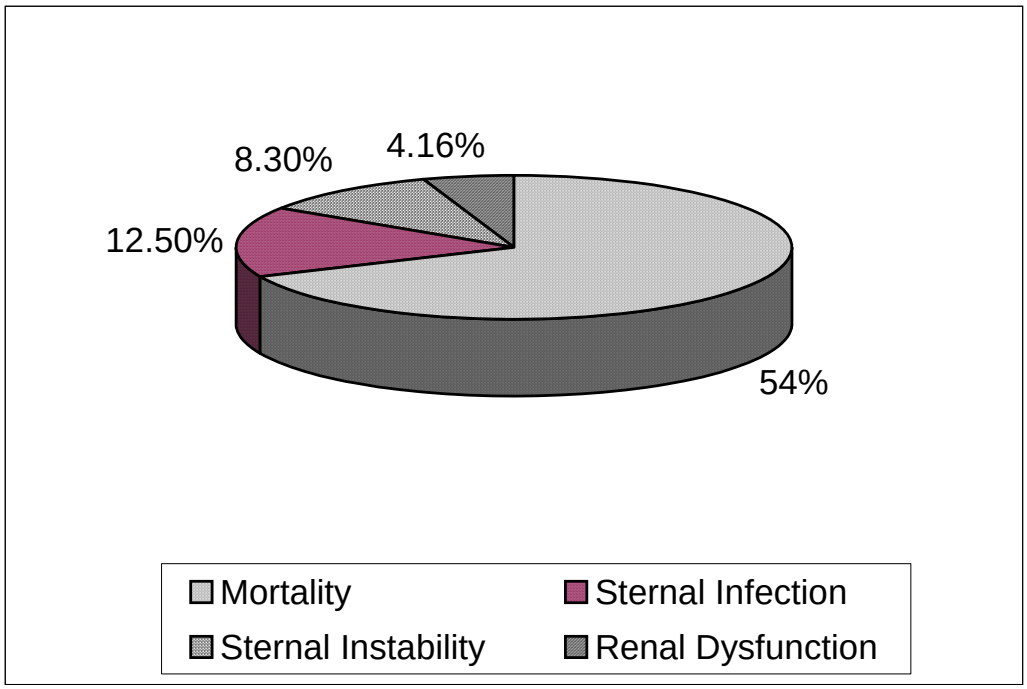
During the study Surgical sites were identified as the cause for post operative bleeding which required Reexploration in 66.6% (16/24) of the patients.

Bleeding from Periosteal Edges of the sternum accounted for 16.6% (4/24) of the patients.

No site of bleeding was identified in 16.6% (4/24) of the patients.

Bleeding from Anastomotic site among CABG patients was identified as the most common cause for bleed accounting for 30% (3/10) of Reexploration in CABG patients.

COMPLICATIONS



PLACE OF REEXPLORATION

Place of Reexploration Among the 24 patients was

Cardio - Thoracic Operation Theatre - 7

Cardio - Thoracic Post Operative ward - 17

Mortality among patients who underwent Reexploration in Cardio Thoracic Operation Theatre was 28.5% (2/7).

While mortality among patients to underwent Emergency Reexploration in Cardio Thoracic Post Operative Ward was 64.7% (10/17).

Provision of Good Reexploration Operation Theatre will be a big boon in reducing morbidity and mortality in patients undergoing Reexploration.

DISCUSSION

The overall incidence of Reexploration among patients following Cardiac Surgery under Cardio Pulmonary bypass was 2.12%.

Comparative study of Reexploration among patients who underwent CABG during this study with that of reexploration for hemorrhage following coronary artery bypass grafting by Dr. Lawrence. J. Dacey.

	Present Study	**Lawrence J. Dacey**
Incidence	4.9%	3.3 %
C.P.B. Time > 150 minutes	60%	11.1%
In Hospital Mortality	60%	9.5%
Distal Anastomosis	30%	12%

Outcome after reexploration in the present study among patients with TVD 83.3% (5/6)

The overall incidence of mortality was found to be High among CABG patients following reexploration.

CONCLUSIONS

Attention towards meticulous haemostasis prior to closure is Mandatory.

Sound surgical technique will reduce incidence of bleeding from sites of Cannulation and Anastomosis.

Adoption OFF PUMP CABG has shown to reduce incidence of post operative bleeding and Morbidity when compare to ON PUMPCABG.

Adoption of Hemostatic Technique for internal mammary artery anastomotic bleeding by which hemostasis can be achieved without the risk of anastomotic stenosis or aggravation of the bleeding, as it avoids placing sutures over the anastomotic suture line.

Patients predicted to have increased risks of bleeding may benefit from prophylactic use of aprotinin, aminocaproic acid, or other agents shown to reduce hemorrhage.

The inherent risk of complications in a patient undergoing Open Heart Surgery can the avoided by encouraging TRANSCATHETER

MITRAL VALVOPLASTY

AORTIC VALVOPLASTY

PULMONARY VALVOPLASTY

and clam shell closure of ATRIAL SEPTAL DEFECT.

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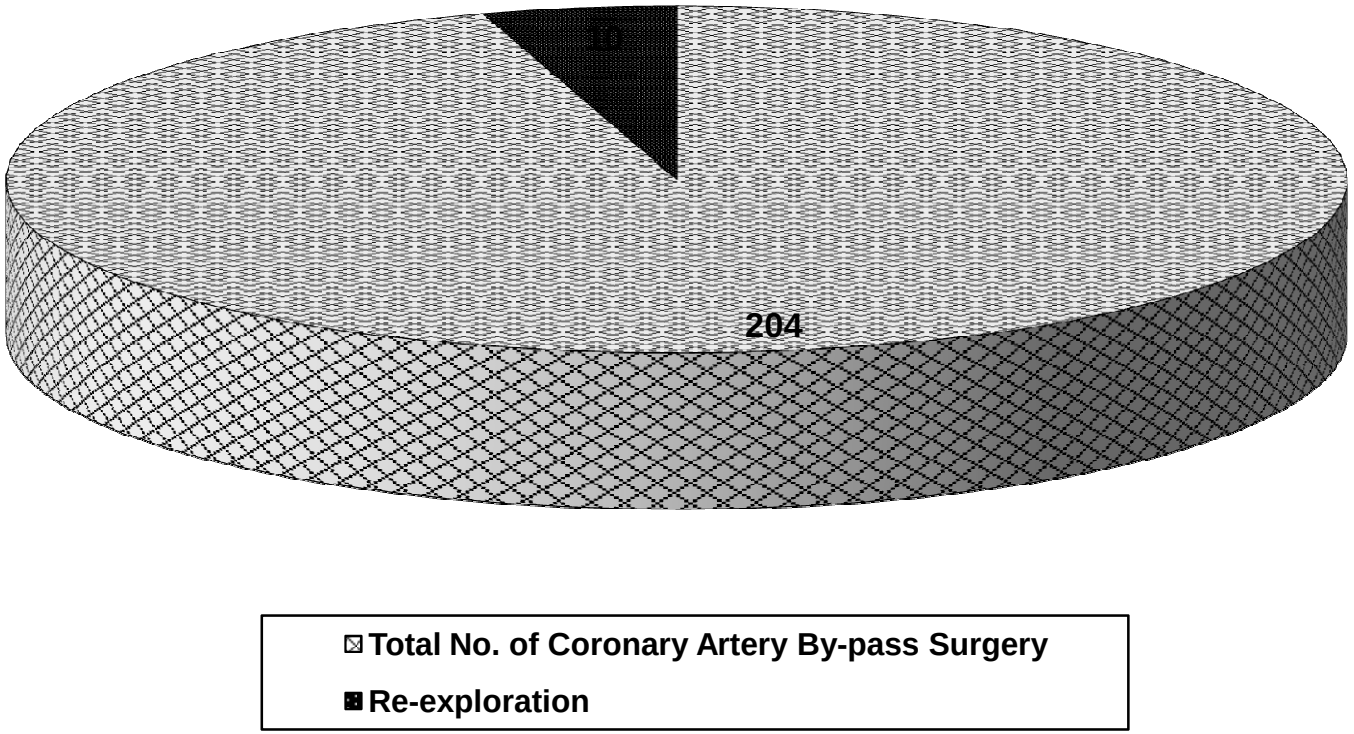
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204
Total No. of Coronary Artery By-pass Surgery
Re-exploration